



National Transportation Safety Board Aviation Accident Final Report

Location:	Honolulu, HI	Accident Number:	WPR13LA222
Date & Time:	05/08/2013, 1520 HST	Registration:	N5ZK
Aircraft:	ROBINSON HELICOPTER R22 BETA	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	1 Minor, 1 None
Flight Conducted Under:	Part 91: General Aviation - Aerial Observation		

Analysis

The pilot reported that, while he was maneuvering the helicopter about 3,000 feet above ground level (agl), the engine suddenly experienced a total loss of power, which was immediately followed by the activation of the low rotor rpm light and horn. In response to the engine failure, the pilot lowered the collective and entered an autorotation. She began to flare the helicopter at an altitude of about 40 feet agl. The helicopter touched down on a road and skidded into a parked automobile.

A postaccident examination of the helicopter revealed that the mixture cable had fracture-separated from the mixture bellcrank control arm located on the carburetor. The bellcrank was positioned near the idle/cutoff position, and the spring was inserted in the wrong direction. The helicopter airframe had undergone an overhaul about 16 hours of flight time before the accident, and, during that overhaul, a mechanic's apprentice installed the mixture hardware. The apprentice improperly rigged the mixture-to-bellcrank hardware, which prevented the mixture cable from moving freely. The repeated stress on the mixture cable resulted in it breaking after a number of operation cycles. When the failure occurred, the bellcrank spring, which is designed to force the mixture to the full-rich position, instead pulled the mixture to the idle/cutoff position, which cut off the fuel. The mechanic overseeing the apprentice reported that he did not visually observe the misrigging and that, if he had performed a tactile inspection, he would have detected the error.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The mechanic's failure to properly inspect the helicopter following maintenance performed by an apprentice, which resulted in a total loss of engine power due to the improper rigging of the mixture control assembly.

Findings

Aircraft	Mixture control - Incorrect service/maintenance (Cause)
	Mixture control - Inadequate inspection (Cause)
	Mixture control - Failure (Cause)
Personnel issues	Post maintenance inspection - Maintenance personnel (Cause)
	Installation - Maintenance personnel (Cause)

Factual Information

On May 08, 2013, about 1520 Hawaiian standard time, a Robinson R22 Beta helicopter, N5ZK, was substantially damaged when it collided with an unoccupied parked automobile following a total loss of engine power while maneuvering over Honolulu, Hawaii. HLM Aviation owned the helicopter, and Hawaii Pacific Aviation (doing business as Mauna Loa Helicopters) operated the helicopter under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The certified flight instructor (CFI) was not injured, and the passenger sustained minor injuries. The local aerial observation flight departed from Honolulu International Airport about 1455. Visual meteorological conditions prevailed and no flight plan had been filed.

The CFI stated that the purpose of the flight was for her to orbit the helicopter over an area known as Punchbowl located about five nautical miles south of the airport. She departed as planned, proceeded to Punchbowl, and completed two orbits before slowing the helicopter to about 35 knots in an effort to help facilitate the passenger in taking his aerial photographs. While maneuvering about 3,000 feet above ground level (agl), the engine suddenly experienced a total loss of power, followed immediately by activation of the low rpm light and horn.

The CFI reported that in response to the engine failure, she lowered the collective and entered an autorotation. She maintained a 60-knot airspeed, and maneuvered to land on a street. The pilot began the flare at an altitude of about 40 feet agl. The helicopter touched down on the road, and skidded into a parked automobile.

A Federal Aviation Administration (FAA) inspector performed a post accident examination of the helicopter. He stated that the mixture cable was fracture-separated from the mixture bellcrank control arm on the carburetor. The bellcrank was positioned near the idle cutoff position, rather than the full-rich position. The spring did not drive the arm to the full rich position per design. The inspector noted that it appeared that the spring was not correctly connected to the mixture arm. The helicopter's maintenance manual stated that during inspection the mechanic must "Verify spring moves arm to full rich position."

The mechanic who routinely maintains the helicopter stated that his company completed a 2,200 hour airframe overhaul of the helicopter on April 22, 2013, equating to about 16 hours of flight time prior to the accident. The mechanic recalled that at the completion of the overhaul, he inspected the helicopter which commenced with the tracking and balancing of the main rotor system, tail rotor system and engine.

The mechanic further stated that he had accompanied the FAA inspector during the post accident examination. They determined that the mixture arm assembly was improperly rigged. The mixture to bellcrank hardware stackup was incorrect and did not allow the mixture cable to move freely and the spring was installed so that the arm was driven to the idle cutoff position. The mechanic opined that the combination of the repeated stress on the mixture cable resulted in it breaking after a number of operation cycles. When the failure did occur, the bellcrank spring, which is designed to force the mixture to the full rich position, instead cut off the fuel by pulling the mixture to idle cutoff. The mechanic remarked that the rigging of the carburetor was accomplished by an apprentice who was under his supervision. The mechanic did not visually observe the misrigging, and reported that if he had performed a tactile inspection, he would have detected the error.

History of Flight

Maneuvering	Loss of engine power (total) (Defining event)
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Pilot Information

Certificate:	Flight Instructor; Commercial	Age:	30
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Helicopter; Instrument Helicopter	Toxicology Performed:	No
Medical Certification:	Class 2 Without Waivers/Limitations	Last FAA Medical Exam:	03/19/2013
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	391 hours (Total, all aircraft), 319 hours (Total, this make and model), 313 hours (Pilot In Command, all aircraft), 26 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER	Registration:	N5ZK
Model/Series:	R22 BETA	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	2158
Landing Gear Type:	Skid	Seats:	2
Date/Type of Last Inspection:	04/22/2013, 100 Hour	Certified Max Gross Wt.:	1370 lbs
Time Since Last Inspection:	15 Hours	Engines:	1 Reciprocating
Airframe Total Time:	8800 Hours	Engine Manufacturer:	LYCOMING
ELT:	Installed, not activated	Engine Model/Series:	O-320-B2C
Registered Owner:	HLM Aviation	Rated Power:	180 hp
Operator:	Hawaii Pacific Aviation	Operating Certificate(s) Held:	None
Operator Does Business As:	Mauna Loa Helicopters	Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	PHNL, 13 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	1415 HST	Direction from Accident Site:	80°
Lowest Cloud Condition:	Few / 4000 ft agl	Visibility	9 Miles
Lowest Ceiling:	Overcast / 5000 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	9 knots /	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	230°	Turbulence Severity Forecast/Actual:	/ N/A
Altimeter Setting:	29.97 inches Hg	Temperature/Dew Point:	27° C / 18° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Honolulu, HI	Type of Flight Plan Filed:	None
Destination:	Honolulu, HI	Type of Clearance:	VFR
Departure Time:	1455 HST	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	1 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Minor, 1 None	Latitude, Longitude:	21.311111, -157.859167 (est)

Administrative Information

Investigator In Charge (IIC):	Zoe Keliher	Adopted Date:	11/13/2014
Additional Participating Persons:	Donald Andera; Federal Aviation Administration; Honolulu, HI		
Publish Date:	11/13/2014		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=86843		

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